

Examining Critical Factors Affecting the Housing Price in New Zealand: A Causal Loop Diagram Model

Abstract

The New Zealand housing market has become a public concern due to the significant surge in housing prices. The steep increase in housing prices has presented significant difficulties for individuals seeking homeownership, particularly for first-home buyers. Therefore, this research aims to identify the crucial factors of the New Zealand housing price system and their influence on housing prices. The system dynamics methodology was applied to organise the cause and effect variables into a causal loop diagram (CLD) illustrating the structure and interaction of the primary feedback mechanisms within the complex system of housing prices. Accordingly, population growth, macroeconomic stability, investment demand, monetary policy, and construction costs were key contributing factors to promoting affordable housing prices and increasing homeownership rates in New Zealand. The construction costs, including the land cost, were the most significant of all the factors. Hence, a call to prioritise optimising construction resources. This research's developed model was validated by exploring experts' views on the model's components and system dynamics. The findings provide relevant stakeholders in New Zealand's residential construction sector with solutions and guidelines for coping with supply and demand fluctuations and reducing economic cycles on material price and workforce development.

Keywords: affordable house, housing price, system dynamics modelling (SDM), New Zealand

1 INTRODUCTION

The New Zealand housing market has recently been a subject of significant public concern and political interest. The soaring house prices have placed a substantial burden on first-home buyers and aspiring homeowners, prompting questions about the underlying factors driving these price fluctuations. Housing is a free-standing human right protected by law (Human Rights Commission - HRC, [2017](#)), and New Zealand's housing crisis requires an immediate response (United Nations - UN, [2020](#)). The crisis is due to the housing costs affordability and residential building availability. Soaring house prices is a source of significant social and economic risks (Parker, [2015](#)), such as (i) the loss of community coherence due to inequality differences; (ii)

macroeconomic instability; (iii) rising unemployment rate; and (iv) maximising household crowding. Hence, the construction sector is pressured by the public and the government to deliver quick and affordable housing.

In 2018, the New Zealand government established the KiwiBuild (2022) as part of the national response to address housing prices and meet the increasing demand. A target was set to build 100,000 homes within ten years through KiwiBuild (2022) to increase homeownership. However, the building target failed to be achieved. The New Zealand Initiative (2019) explained that high construction costs due to materials and land values are the main reason for the underachievement of KiwiBuild (2022). The Organisation for Economic Co-operation and Development- OECD (2019) have also reported that the housing supply in New Zealand is declining, and there is a need to improve housing availability and affordability. The report outlined measures to assist the government in promoting housing affordability. The measures include improvements in infrastructure funding, land use regulation, and risk-sharing with the construction sector (Organisation for Economic Co-operation and Development - OECD, 2019).

Moreover, housing prices in New Zealand are rising rapidly to become progressively unaffordable. The construction sector fails to meet the projected demand for residential buildings by providing more new builds. According to the Reserve Bank of New Zealand - RBNZ (2013), the residential market demand is driven by the population growth in Auckland and the Canterbury post-earthquake rebuild. However, due to geographical and regulation factors, the supply is constrained by interest rates, building costs, and land availability (Reserve Bank of New Zealand - RBNZ, 2013). While construction plays a crucial role in the housing market, a comprehensive understanding of the various factors influencing housing prices is imperative.

Recent statistics show New Zealand has the highest house prices and the lowest affordability among Canada, Australia, and the entire OECD countries (Organisation for Economic Co-operation and Development - OECD, 2019). The Real Estate Institute of New Zealand - REINZ (2020) reported that median house prices in New Zealand have increased by 19.8% since 2019. Notably, Auckland reached a historical house price median high record of \$1 million in October 2020, even though the city experienced a significant number of consented dwellings for the same year (Auckland Council, 2020b).

New Zealand's Ministry of Housing and Urban Development (2020) briefing acknowledged the COVID-19 pandemic challenges and outlined the need to tackle the chronic and systemic barriers pushing the current housing shortage. The barriers include construction costs, infrastructure

funding, land use regulations, the rise in migration, and population growth. Furthermore, the report highlighted that increasing house prices promotes houses as an investment, leading to higher prices and market inflation. Nevertheless, homeownership recorded the lowest rate of the century in 2018, primarily for first-home buyers and those with average income (StatsNZ, 2020a).

There are a set of factors from within the construction industry and other social, economic, and political factors affecting the extremely high house prices in New Zealand. The current population of New Zealand is over five million (StatsNZ, 2020c); hence, population growth is a crucial indicator of the gap between the supply and demand for housing (StatsNZ, 2017b). Auckland region has the highest population growth rate, along with the number of dwellings issued for residential buildings (Auckland Council, 2020a). However, the housing stock and building availability are still behind the residential demand. In a global context, New Zealand consistently ranks among the top developed countries with the highest housing prices (Reserve Bank of New Zealand - RBNZ, 2022). The rapid growth in residential construction and a booming population have created an imbalance between supply and demand in the housing market. This imbalance and elevated construction costs have decreased the number of available dwellings per person. The interplay between solid demand and limited supply has propelled house price inflation in New Zealand to the highest level.

Several studies have identified factors like population and construction costs in the evolving literature on housing price systems. However, it is essential to recognise that the dynamics and their impact on the housing price system may differ in New Zealand compared to other countries. For instance, fertility and reproductive rates significantly influence the population in China (Liu et al., 2020), whereas immigration has a more pronounced effect in Australia (Moallemi & Melser, 2020). In Namibia (Kakuru & Kaulihowa, 2022) and Vietnam (Nguyen et al., 2021), construction costs, income and lending rates, and GDP are critical determinants of house prices, but the investment decisions and policy implications differ in each country. Therefore, there is a pressing need to investigate the factors affecting housing prices in New Zealand to formulate effective policies and strategies addressing housing affordability concerns. A thorough understanding of these factors makes it easier to make evidence-based decisions in the residential sector. Hence, it is imperative to bridge this research gap to provide a solid foundation for decision-making.

Many existing approaches to studying housing prices in New Zealand focus on specific factors and lack a comprehensive perspective that considers the entire supply-demand system. These approaches often overlook the intricate dynamics of the housing market. Nevertheless, housing

prices are influenced by interconnections, dependencies, and feedback loops. To comprehensively understand the complexities of high housing prices, it is essential to analyse the interactions among various components and how they collectively contribute to this phenomenon. Hence, this research aims to investigate and analyse the contributing factors to housing prices in New Zealand using the causal loop diagram (CLD) approach with expert views. A clear understanding of contributing factors provides valuable insights for policymakers, investors, and stakeholders to devise informed strategies for promoting a sustainable and affordable housing market.

Combining CLD and expert views offers a qualitative, evidence-based system view for understanding these factors and their intricate interrelationships. This approach differs from previous studies that primarily rely on quantitative analysis or traditional econometric models. The results from this research are expected to provide improved knowledge and understanding for the industry to cope with demand fluctuations and reduce the effects of economic cycles on material prices and workforce development. In addition, the research contributes to target 11 in goal 11 of the United Nations - UN (2015) sustainable development goals (SDGs), which measure safe and affordable housing.

2 CLD MODELLING

The CLD is a qualitative visual tool within the system dynamics (SD) field that helps conceptualise the connection between variables and the feedback interaction effect between them (Bala et al., 2017). SD modelling was first developed by Forrester (1958) in the 1950s to provide managers and policymakers with knowledge and a better understanding of complex industrial problems. Over the years, SD modelling has proven its strength in achieving valuable and reliable results.

Liu et al. (2019) outlined the critical steps for applying dynamic modelling to a system as follows: (i) addressing the problem by identifying the essential variables and their behavioural dynamics; (ii) conceptualising the system using the dynamic hypothesis; (iii) formulating the model; and (iv) testing and validating the model. The CLD approach has a well-established history in academic research and has been applied in various housing market contexts. However, they also have drawbacks when applied in this specific field due to the complex factors affecting housing prices. Qualitative CLDs are better suited for understanding system behaviour and identifying key variables and feedback loops than for making precise predictions. Also, validating qualitative CLDs can be challenging with a lack of quantifiable data. It can be

challenging to assess the accuracy of model predictions and whether they align with real-world observations.

To overcome the limitations of using solely qualitative CLDs, experts can participate in model validation at any stage of the model development to obtain adequate components and adjust the system dynamics (Andersen et al., 2012). CLD models are widely recognised for providing the capability and ability to provide an expert-driven qualitative assessment of the structural components of any system (Aikenhead et al., 2015). There is a growing interest in using interviews as a practical approach to include experts' opinions in the system due to the benefit of exploring divergent thinking (Andersen et al., 2012).

This research follows the essential processes in developing the CLD model as summarised by Walters et al. (2016), see Figure 1. The CLD qualitative approach was adopted based on the literature review of relevant research publications. The data from the reviewed literature was interpreted into the model as the variables of concern. Then, the interviewing approach was employed by presenting the CLD model with a brief description of its dynamics to experts in New Zealand's residential property market.

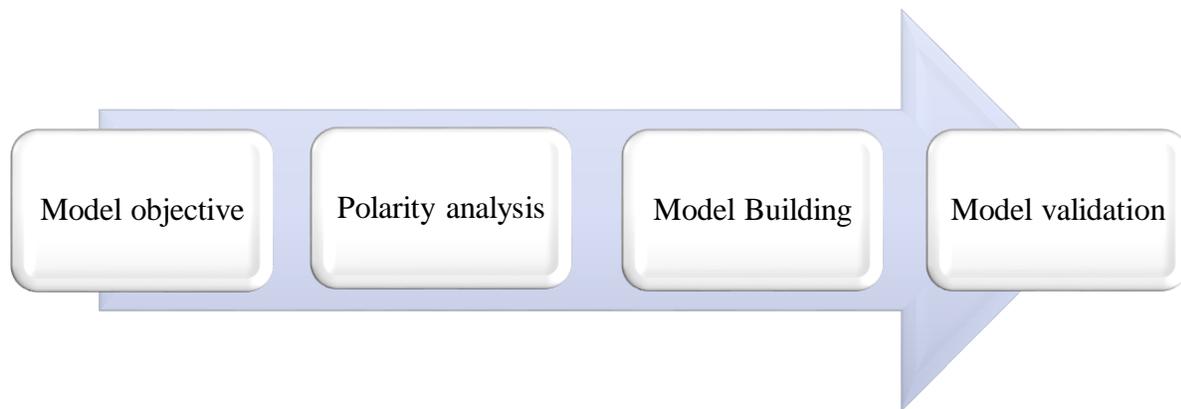


Figure 1 Summary of the main processes in developing the CLD model

The representation of variables and their dynamic behaviour in the CLD model is described by Marzouk and Hosny (2016) to include: (i) nodes to illustrate variables; (ii) arrows for connecting the nodes and showing relations; and (iii) positive and negative signs to indicate the effect of the variable's relationship and the causal direction. Feedback loops (i.e., balancing loop or reinforcing loop) emerge after representing the identified variables and their interconnection. The balancing loop (B) reflects the inversely proportional relationship between two variables, whilst the reinforcing loop (R) reflects the directly proportional relationship (Hjorth & Bagheri, 2006). There are different software tools to visualise the SD model, such as Vensim, iThink, and Stella.

Accordingly, Vensim was the selected software tool for this research because of its vast recognition in providing clear and comprehensible models (Eberlein & Peterson, 1992). Vensim is also a powerful tool for supporting the ability to develop, explore, analyse, and optimise model dynamics (Eberlein & Peterson, 1992).

3 MODEL COMPONENTS

3.1 Population

The population increase from immigration and the change in monetary policy have been identified by Badcock (2004) as the major factors that triggered the bust and boom cycle in Auckland's residential property market since the early 80s. Hargreaves (2008) confirmed that population growth due to immigration and the "baby boomers" period is the reason for high house prices. These results were also confirmed by Janet Ge (2009), who observed that an increase of 1% in immigration is correlated with a lagged effect of a 10% rise in house prices. However, Stillman and Maré (2008) challenged the immigration factor and estimated its effect on house prices as a slight impact. Nevertheless, the study observed that a 1% growth in population contributed to an increase in house prices by 0.2 to 0.5%. The study justified population growth by the rise in New Zealanders (or Kiwis) returning to New Zealand, increasing house prices by 6% to 9%.

Comparably, Égert and Mihaljek (2007) analysed house prices in New Zealand and other OECD countries. The study concluded that house prices' dynamics include the pay rate, interest rates, labour market, and rising population and immigration rates. Another study reviewed the relationship between the immigration pace, interest rates and the housing price index (HPI) in New Zealand and found that immigration is an influential factor in increasing house prices (Chong, 2020). A set of socioeconomic factors explains the increase. At the social level, immigrants tend to start their new lives by renting since adapting to a new country and securing work is challenging for financing a house purchase (Chong, 2020). At the economic level, the wage rate for immigrants determines the increase in the demand for either buying or renting a house (Chong, 2020). Specifically, the rise in house prices correlates with the immigrant's income level and ability to adapt to New Zealand. The study revealed that a 1% rise in immigration activity leads to a 0.3% rise in the HPI. Moreover, an effective financial policy could control house price inflation (e.g., a rise of 1% in mortgage interest rate would lead to a lower HPI by 1.44%) (Chong, 2020).

Furthermore, Martin et al. (2018) listed immigration as a reinforcing factor in population growth. The study suggested that high population growth lowers residential stock availability and constantly pressures the supply of new dwellings. More evidence was provided by Gevorgyan (2019), who analysed data from New Zealand and other OECD countries. The results revealed that countries challenged by the high rise in house prices also encountered rapid population growth. Likewise, Larkin et al. (2019) compared the impact of immigrants on house prices in some developed countries, including New Zealand, pointing out that a high immigration rate pressurises the housing market due to the high demand for dwelling properties. However, the study argues that the immigration impact on house prices can vary by region depending on the attitude of the natives in the destination country (Larkin et al., 2019). The study elaborated that a negative attitude toward immigrants counteracts the demand for housing in these areas and neutral house prices in the market.

Rocketing house prices are higher in regions with higher price deviation due to increased immigration activity (Nunns, 2020). The rise in immigration caused poor labour allocation from the regions of high productivity in New Zealand, such as Auckland and Wellington. Also, it caused an increase in labour movement from New Zealand to Australia. Preval et al. (2016) explained that the high increase in house prices in Auckland was due to increased demand from population growth and the immigration rate. Long-term minimal interest rates and ineffective capital gains and income tax policies are also existing factors. At the same time, fulfilling demand is challenged by the shortage in supply factors such as lack of skilled labour, costs related to the consenting process, and restrictions on housing redevelopment planning.

Several studies from Australia have contributed to similar research results. For instance, Moallemi and Melser (2020) examined the impact of immigration on housing prices in Australia, indicating that for every 1% rise in the population of immigrants, there is an associated yearly rise in housing prices by around 0.9%. However, the correlated rise is determined by the region, the immigrant's origin, and the building type (Moallemi & Melser, 2020). In similar research, Sá (2015) found that immigration has a negative effect on house prices in the UK, which means that the growth in the immigrant population will reduce house prices. The explanation for that is linked to the variance in the wage gap between immigrants and natives. For example, areas with a high population of immigrants are more likely to be in the lowest position of the income line. Thus, low income will negatively affect house prices in these areas by the decrease in demand. Arguably, Day (2018) highlighted that house prices are rising due to the increasing household formation pace associated with population growth. Hence, population growth is linked to the increase in immigration activity and the decline in the average size of a household.

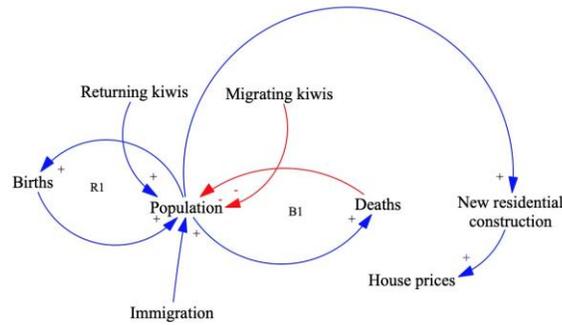


Figure 2 The CLD model for the dynamics of the population

To summarise, Figure 2 represents the CLD model for the population factor and the dynamics between the related variables. The dynamic behaviour between the identified variables helps to understand how the population plays a significant role in rising house prices. Population growth mainly consists of the natural birth and death rate variables. Death rate and Kiwis leaving New Zealand are balancing variables to the population rate as in B1. However, the birth rate, immigration rate, and the returning Kiwis from overseas reinforce the pace of population as in R1.

The variable 'returning Kiwis' is introduced to capture the movement of New Zealanders back to the country, distinguishing its impact, especially in the post-COVID-19 era, from the immigration effect, which is often subject to immigration policies and regulations. Additionally, 'migrating Kiwis' signifies the internal movement of New Zealanders within different regions of the country due to regional differences in economic activities. The reviewed studies indicated that the immigration rate and the returning Kiwis from overseas to New Zealand drive house prices at an abnormal rate. This is because the expedited increase in population is positively linked with new residential construction. The substantial increase in population pressures the need for new residential construction, maximising the supply and demand gap and minimising the housing stock availability. Hence, house prices increase since there will be time for the new construction to counterbalance the total stock.

3.2 Macroeconomic stability

GDP and employment rate are the main macroeconomic variables associated with the housing market's performance (Martin et al., 2018). These variables are indicators of labour productivity and the use of resources in the construction sector. Bowden (2004) investigated the influence of new residential construction activity on the housing market as a macroeconomic indicator,

highlighting that increasing the number of dwelling consents and construction work boosts GDP. The study suggests low-interest rates observed in the 90s helped mitigate inflation in the residential market and led to adjustments in house prices.

New Zealand has evidence linking policy rates, mortgage rates, and housing prices from 1999 to 2009 (Shi et al., 2013). Policy rate changes are linked to fixed interest rate changes, and fixed interest rates positively influence housing prices, even after considering other economic factors. Interestingly, during the studied period, increases in the policy rate did not lead to a decline in housing prices. The effects of macroeconomic shocks due to the increase in tradable goods prices on house prices in Australia and New Zealand were also investigated by Leung et al. (2013). The results revealed that the increase in the prices of goods significantly increases the GDP, which incites employment and positively affects income (Leung et al., 2013). This increase in income level encourages homeownership, hence affecting house prices. However, the government policy on trading goods can restrain house prices. In a similar study, Fraser and McAlevey (2015) inspected the effect of macroeconomic shocks on house prices by analysing economic data from the housing market in different regions in New Zealand. The housing market's variance at the national level resulted from the difference in responding to macroeconomic variables, specifically interest rate and GDP. Finally, Hall and McDermott (2019) concluded that the low employment rate and the inflammatory house prices significantly impact personal and corporate liquidity. Therefore, the ability to pay will decline, causing solvency and affordability problems and high market inflation.

Moreover, Squires and Webber (2019) analysed the interconnections between the macroeconomic variables, including income and interest rates, and the fluctuating house prices amongst different regions in New Zealand. The decrease in interest rates after the global financial crisis in 2008 increased house prices and income level variation. However, this result varied between regions due to regional economic activity variations (Squires & Webber, 2019). For example, the economic regions that depend on the tourism market, such as Otago Lakes, experienced the slightest increase in income level due to the drop in tourism activities. Thus, the decline in income created affordability problems in these regions. Contrarily, other economic regions, such as Auckland and Wellington, depend on services and the labour market and experience an insignificant impact. Hence, the study suggested that lowering the interest rate in adjusting house prices is more powerful when including external macroeconomic shocks and regional differences (Squires & Webber, 2019). Accordingly, European evidence suggests that macroeconomic stability can be achieved by monitoring correlated factors, including labour costs, house prices, and the employment rate (Pera, 2016).

While the construction industry has a record of low productivity worldwide, the productivity growth trend is another critical indicator in New Zealand's construction sector due to its impact on project costs and time overruns. The Building Research Association of New Zealand- BRANZ (2020) reported that New Zealand's construction industry recorded the lowest average growth of 0.9% among other leading industries since 1994. The report concluded with a set of key benefits of improving productivity in the construction industry, including (i) an increase of 5.4% in the production of the residential construction sector (ii) an increase in the economic capital investment; (iii) an increase in the total national GDP; and (iv) a decrease in the industry's total building costs. Since construction projects are labour-intensive, productivity is directly linked to economic growth and employment rates. Accordingly, the employment rate in New Zealand's construction sector is fast-growing, with an average yearly increase of 1.7% (Ministry of Business, Innovation and Employment - MBIE, 2019b). However, New Zealand's construction sector is currently facing challenges, including a shortage of skilled labour, a lack of regulations, the need for organised leadership, and an existing culture of risk transfer (Ministry of Business, Innovation and Employment- MBIE, 2019a).

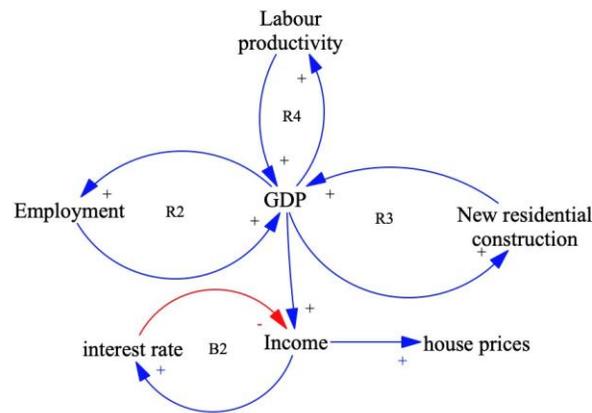


Figure 3 The CLD model for the macroeconomic stability dynamics

Figure 3 visualises the dynamics of the macroeconomic stability effect on house prices. There are three reinforcing loops, namely R2, R3, and R4 and one balancing loop, B2. Referring to R3, residential building activity is directly proportional to GDP. The increase in residential building activity is a positive sign for the GDP since the construction sector highly contributes to the total GDP. As a result of the increase in GDP, the employment rate increases and vice versa, leading to a reinforcing loop, R2, that positively affects the income variable and labour productivity as in R4.

This model's macroeconomic variables include GDP, employment, interest rate, and income. The interactions of the macroeconomic variables with labour productivity and construction activity were found to affect house prices. Those relevant variables also interact with other identified high-house price factors. Perfect economic conditions with high employment rates and income growth positively impact the housing market. Rising employment and incomes with high GDP enable productivity, and more people can afford house purchasing, leading to increased demand for new residential construction, particularly in areas with limited supply. Higher-income levels empower buyers to afford higher-priced properties, driving up house prices. Conversely, lower incomes may constrain purchasing power, exerting downward pressure on house prices. The interest rate on mortgages significantly affects the borrowing capacity of homebuyers. Lower interest rates make homeownership more affordable, stimulating housing demand and increasing house prices. This explains the inverse relationship between the interest rate and income, as in B2.

3.3 Investment demand

House ownership significantly contributes wealth to New Zealanders (Dupuis & Thorns, 1997). The increase in house prices is influenced by inflation related to the economic and political benefits. Consequently, financial and government housing policies impact the accumulated individual's housing wealth. Janet Ge (2009) indicated that investment demand prompted by low-interest rates drives house prices. However, the increase in house prices does not happen instantly as investors tend to develop trust in the market first. Evidence from Hargreaves and Shi (2005) and Hargreaves (2008) revealed that current property owners dominate the New Zealand housing market as investors, influencing the housing market and fluctuating house prices.

Furthermore, Zhao et al. (2019) elaborated on the effects of house prices at the social and economic levels in New Zealand. At the social level, the residential market boom is a prosperous sign of the public's standard of living. However, the high volatility in house value maximises household liability, minimising individual wealth and affordability (Zhao et al., 2019). At the economic level, the prompt increase in housing prices resulted in rapid investment growth in New Zealand's residential sector, misguided the market and resource allocation. Filippova et al. (2020) mentioned that purchasing houses as an investment is conventional in New Zealand, either for reselling or to expand equity. The study revealed that an average family's median time of property-owning is six years. This result was confirmed by Chong (2018), who pointed out that the increasing demand for property investment exaggerates house prices and lowers affordability.

Greenaway-McGrevy and Haworth (2020) identified the rise in immigration and land use regulation as contributing factors to high house prices in New Zealand. However, the results suggested the 'loss aversion' behavioural attitude as another influential factor. Loss aversion refers to the reluctance to accept a low-profit margin for selling a house but prefers waiting for more time. The study suggested that strengthening the supply and demand policies regarding loss aversion may play a key role in sustaining house prices, especially for first-home and average-income buyers (Greenaway-McGrevy & Haworth, 2020). Furthermore, Nunns (2020) observed that population growth, mortgage credit availability, and tax policies stimulate property investment and housing demand. Another study by Danan Joyo et al. (2020) revealed that investment decisions influence house prices, income levels, and the ability to obtain easy financing. The study results indicated that investors with high income and quickly approved loans tend to invest in higher-priced houses (Danan Joyo et al., 2020). Hence, the anticipation drives investors' inclination that higher-priced houses return more profit.

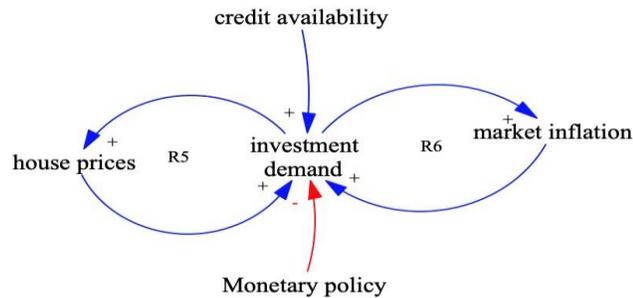


Figure 4 The CLD model for the investment demand dynamics

Figure 4 is the model for the dynamic interaction of investment demand. The model includes two reinforcing loops, R5 and R6, to indicate the proportional relationship between house prices, market inflation, and investment demand. The literature suggests that property investment is highly preferred for New Zealanders, although high investment demand induces price inflation in the real estate market. Consequently, high house prices incentivise investors to look for an opportunity with more returns. Since the review mentioned that most New Zealand investors are homeowners, access to available credit is highly anticipated to be easily secured. Hence, the positive sign of credit availability indicates the effect of stimulating house investment. Also, the accelerating demand for house investment leads to overvaluing the houses to obtain higher profit margins. Therefore, R6 shows the reinforcing effect of the boost in investment on inflating the residential market.

3.4 Monetary policy

According to the New Zealand Institute of Economic Research - NZIER (2021), monetary policy is a control measure enacted by the reserve bank of New Zealand to influence the economy. Monetary policy aims to reduce inflation and retain a sustainable employment rate (New Zealand Institute of Economic Research - NZIER, 2021). The main monetary policy tools regarding house prices are the interest rate and loan-to-value ratio (LVR). LVR is defined as "a measure of how much a bank lends to a borrower, relative to the value of the borrower's property secured against the lending" (Reserve Bank of New Zealand - RBNZ, 2019).

Shi et al. (2014) examined the influence of the policy interest rate on house prices in New Zealand and found that increasing the policy interest rate will not limit the rapid increase in house prices. The study suggested considering two factors for a better policy rate (Shi et al., 2014). The first factor is a combined interest of fixed and floating rates, while the second is the house loan amount (Shi et al., 2014). Moreover, Armstrong et al. (2019) assessed the effect of implementing the LVR restrictions on house prices in New Zealand, revealing that LVR significantly reduces the house prices boom by restricting the demand due to credit availability. The study suggested that policy effectiveness is achieved by maintaining the rate of increasing house prices simultaneously during the enacting time (Armstrong et al., 2019). Specifically, the rapid increase in house prices reduces the benefit of restricting the LVR ratio. Recently, De Roiste et al. (2020) reviewed how implementing a low policy rate reduces house prices. The study results revealed a drop in mortgage interest rates that reflected positively on the property market.

The recent COVID-19 global pandemic also played a vital role in the latest soar in house prices, with challenges of economic recession contributing to high uncertainty in the construction sector. Consequently, the Reserve Bank of New Zealand responded by lowering the interest rate and removing the LVR restrictions to ease house prices and revive the property market (Reserve Bank of New Zealand - RBNZ, 2020). Contrarily, the policy change lifted house prices even more (Auckland Council, 2020b).

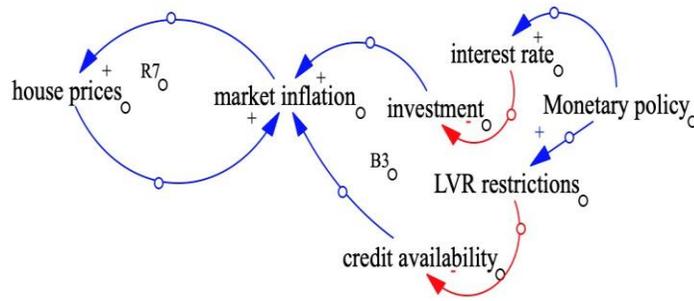


Figure 5 The CLD model for the dynamics of monetary policy

Figure 5 shows the dynamics of implementing a monetary policy into inflation and house prices. Following the balancing loop B3, implementing the monetary policy positively affects the interest rate and LVR. To simplify, in market inflation, the Reserve Bank of New Zealand (RBNZ) tends to change the monetary policy to balance inflation. As a result, the monetary policy has a directly proportional relationship with the interest rate. This means that increasing the monetary policy in a state of inflation leads to a high-interest rate. Hence, turning off investment restrains the persistent increase in house prices and deflates the market. Simultaneously, the increase in monetary policy increases the LVR, which is inversely related to credit availability. This implies limiting the accessible finance for home loan investment, causing a drop in investment demand. Furthermore, the reinforcing loop of R7 illustrates the directly proportional link between house prices and market inflation. High house prices incentivise investment; the investment behaviour pressures the market as in B3 for more house prices.

3.5 Construction costs

Construction costs significantly drive house prices in New Zealand (Bourassa et al., 2001). Other drivers include employment, income level, immigration, and interest rate. Hargreaves (2008) pointed out that the construction costs affecting house prices in New Zealand are mainly related to land costs and lack of labour. Another study explained that housing affordability in New Zealand is highly affected by productivity growth in the construction sector (Tran & Tookey, 2011). The study also found that land and materials costs influence labour productivity in New Zealand and suggested that improving labour productivity regarding land and materials costs will improve the construction sector's total performance (Tran & Tookey, 2011). This view is also supported by a similar study that explored the variables of building costs in low-rise and high-rise residential buildings (Zhao et al., 2019). The study observed that house prices positively correlate with building costs and work volume. Zhao et al. (2020) emphasised that accurate cost

estimation of building costs in residential construction projects significantly affects house prices in New Zealand. The study highlighted the construction cost index as an indicator of estimated costs regarding labour, material, and equipment (Zhao et al., 2020). The results also showed that oscillated house prices cause fluctuations in residential construction costs.

Several recent pieces of literature explored the role of land use regulation and geographic differences in increasing house prices. For instance, Danan Joyo et al. (2020) agreed that the available and affordable land shortage is a crucial driver of high house prices in New Zealand. Nunns (2020) suggested that constrained housing supply is the reason for high house prices. The study identified supply constraints to include: (i) urban planning policies such as zoning; (ii) limited refurbishment works; (iii) requests for additional features that are either highly regulated, such as land with environmental amenities or expensive, such as on-site car-parking (Nunns, 2020). Another study argued that land use regulation is the main contributor to high construction costs in New Zealand and revealed that heavily regulated land use slows the development of new residential construction (Lees, 2019). Hence, land use regulation limits the housing supply, resulting in higher house prices due to ongoing demand. In addition, Waights (2019) observed that land-use regulations in historic areas contribute to higher house prices. The study suggested that the associated increase in house prices is due to the high land values and construction costs.

Furthermore, Fernandez and Bucaram (2019) inspected the environmental amenities as a cause of the high house prices in the Auckland residential market. Land use regulations and nearby amenities influence urban development in Auckland due to the city's geographical diversity. Therefore, effective urban design and planning must align with using environmental amenities and the effect on the property market value (Fernandez & Bucaram, 2019). The study challenged that house prices in some areas are affected by the regulated amenities to protect them. Accordingly, an investigation of the effect of housing policies such as inclusionary zoning (IZ) and special housing programs to increase housing supply and affordability was conducted (Fernandez et al., 2019). These programs either mandate or offer perks for developers to supply affordable house prices. However, the study outcomes indicated an increase in house prices and an insignificant effect on affordability. The increase in house prices resulted from the additional costs to accelerate the consenting process, the lack of adequate regulations, and the unclear definition of mandatory and voluntary in these housing policy programs (Fernandez et al., 2019).

Bali et al. (2019) examined the unpredictable change in house prices regarding the macroeconomic factor in different regions in New Zealand and found that regions of high tourism attraction are more vulnerable to fluctuating house prices. The study suggested that the

regional level must take any policy change to sustain the price fluctuation. A similar study by Tsui et al. (2019) also inspected the impact of tourism and airline capacity on New Zealand house prices and reported a positive impact on the regional housing markets due to the increased activity and capacity in the regional airline. Additionally, Bade et al. (2020) observed that houses in areas with heritage values (e.g., a historical land or cultural asset) experienced higher prices. Houses in these areas are evaluated depending on a set of factors, including the location, the economic value, and the aesthetic quality of the heritage to the buyer (Bade et al., 2020). Finally, the study examined the Auckland region as it offers a wide range of areas with environmental amenities that interest wealthy buyers. However, restrictions on urban development in these areas challenge protecting its heritage value. The findings imply that easing restrictions on using areas with heritage would allow better use of the resources in heritage areas and experience prospective growth in the housing market (Bade et al., 2020).

Similarly, Somerville (1999) found that residential building costs are correlated with increasing house prices in the US. The study explained that the failure to accurately estimate construction, material, and labour costs would affect house prices. Regarding construction materials, Tobi et al. (2018) analysed the effect of material costs on house prices using 3D printing technology in the UK, suggesting that implementing innovative technology can lower construction costs, which reduces house prices. Another study by Tawil et al. (2014) indicated that the increase in house prices in Malaysia is correlated with increasing material, labour, and land costs.

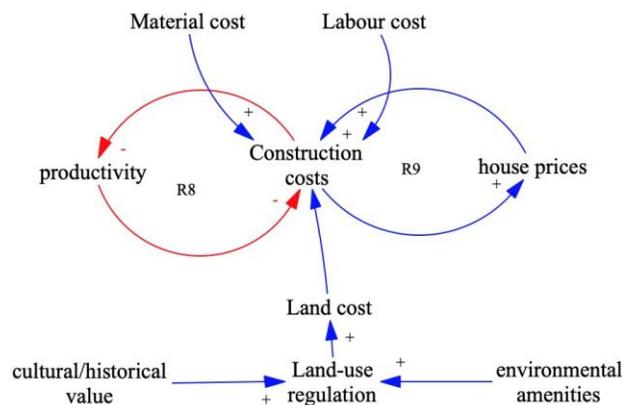


Figure 6 The CLD model for the construction costs dynamics

Figure 6 is an interpretation of the latter reviewed literature. Construction costs include labour, material, and land costs. Thus, the rise in component costs increases the total construction costs. Following the reinforcing feedback loop of R9, construction costs are directly proportional to

house prices. The more the estimated construction costs, the higher the house prices. Regarding land costs, the reviewed papers suggested that the government restrictions and regulation of land use due to conserving cultural, historical, or environmental value is the reason for high land costs. The last identified variable, labour productivity, is related to construction costs negatively reinforcing loop R8. Higher productivity indicates efficient processes, advanced technology, and skilled labour, reducing time and resources. On the other hand, lower productivity is caused by inefficiencies and delays, leading to increased labour and material costs.

4 DEVELOPED CAUSAL LOOP DIAGRAM (CLD) MODEL

This section incorporates the CLD model from the components. The model is structured based on the factors resulting from the existing literature review. Accordingly, five determinant factors driving high house prices in New Zealand are identified (i.e., population growth, macroeconomic stability, investment demand, monetary policy, and construction costs). Figure 7 represents the developed model of the CLD and the interacting dynamics between these factors and house prices in New Zealand.

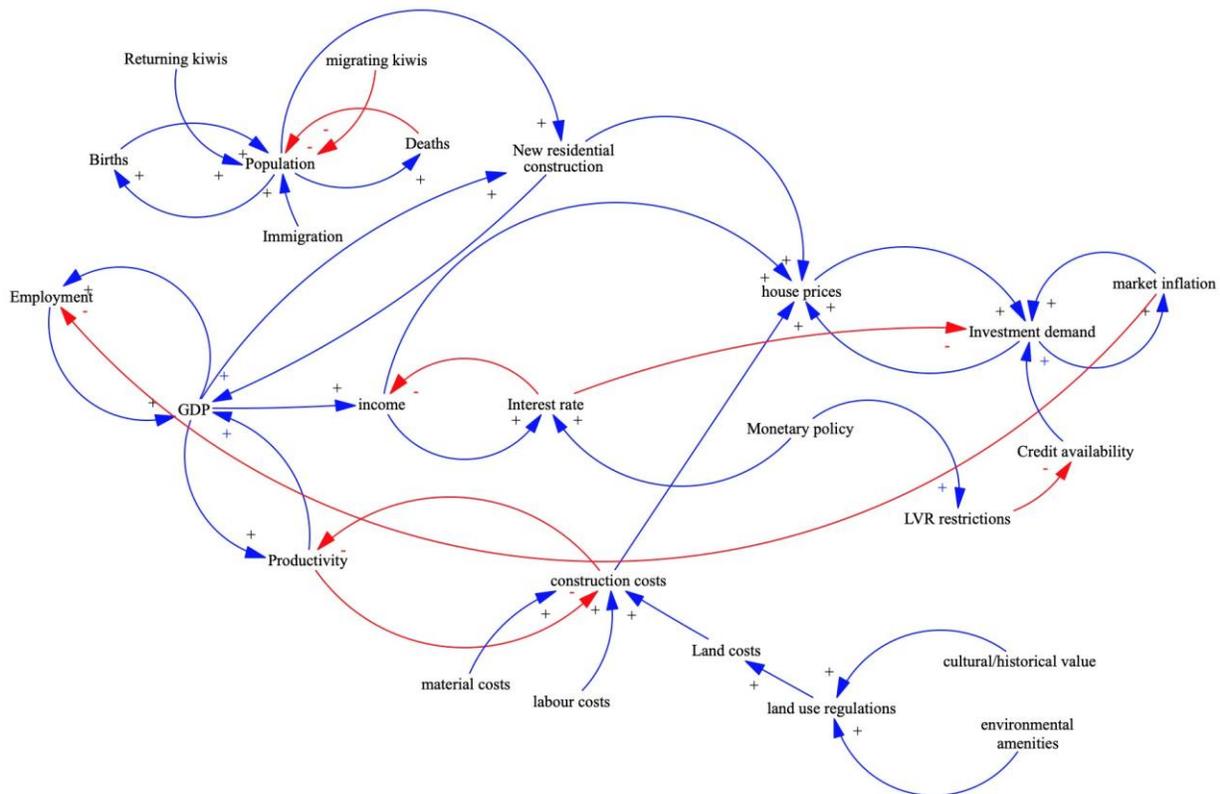


Figure 7 Developed CLD model

5 MODEL VALIDATION

Based on the objectives of the developed model, it would be more valuable to provide a further explanation of the causal factors of high house prices in New Zealand and the relationship among them. Accordingly, the CLD model was reviewed by experts with vast knowledge of the New Zealand residential property market to establish confidence in the model variables, dynamic relations among variables, and the high house prices. Four experts were purposefully selected for the validation exercise based on the following criteria: (i) must have at least three years of experience in the New Zealand residential property market; (ii) must be working as financial advisors; (iii) must have home mortgages; and (iv) must be experienced as residential sales agents.

Table 1 illustrates the experts' opinions about the high house prices CLD model. Throughout the expert validation process, the influence of income levels on housing prices was elucidated for enhanced clarity. All experts agreed on the factors identified and the model's variables. However, expert #4 expressed that they are unsure about the land-use costs and regulation or how it influences rising construction costs the most. Additionally, expert #1 was unsure about the role of interest rates in stimulating the investment demand in the model. A further explanation was provided to the interviewees to indicate that interest rates have a limited effect in periods of high demand. According to the final CLD model, investment demand and interest rate are inversely related and are balanced by monetary policy. Based on all experts' insights, no adjustments have been made to the variables and their dynamics.

Table 1 Overview of expert's opinions about the house prices CLD model

Summarised statements		Expert 1	Expert 2	Expert 3	Expert 4
Population growth drives the pressure demand for new residential construction supply.		Agree	Agree	Agree	Agree
The new residential construction supply is strengthened by the macroeconomic variables, GDP, and employment (high GDP means more construction work that will increase the need for labour).		Agree	Agree	Agree	Agree
The rise in income level affects house prices positively for two reasons.	The first reason: a high income level means a rise in pay rate, which raises labour costs. High labour costs drive construction costs to increase, leading to an increase in house prices.	Agree	Agree	Agree	Agree
	The second reason: stimulates investment demand for high-income people, pressuring the market and driving house prices higher.	Agree	Agree	Agree	Agree
The interest rate has played a key role in stimulating the investment demand in residential property.		Agree	Agree	Agree	Agree
The monetary policy is expected to restrain investment, deflate market inflation, and sustain employment.		Agree	Agree	Agree	Agree
Construction costs have a direct positive effect on house prices (if construction costs increase, house prices increase).		Agree	Agree	Agree	Agree

Land-use costs and regulations are the most influential factors raising the total construction costs.	Agree	Agree	Agree	Agree
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6 FINAL CLD MODEL AND DISCUSSION

The CLD model in Figure 7 is final and justified as valid by the experts. Although the population factor was initially found to affect residential construction activity, it is justified to be triggered by the influence of immigration. The impact of immigrants arriving in New Zealand should not be overlooked. According to StatsNZ (2020b), the number of Kiwis arriving from overseas has recently reached a historical record due to the impacts of the Covid-19 pandemic. The shutdown in the construction sector due to the national lockdown also worsened the gap between supply and demand. Hence, it is anticipated that the population rate may experience a change in pattern over the next few years.

The model highlights several interconnected factors that influence the boom and bust cycle of residential construction in New Zealand and its impact on the country's GDP and housing market. The fluctuations in the population rate play a crucial role in the residential construction cycle. Changes in population size and growth rates can affect the demand for housing, leading to fluctuations in construction activity. The construction industry in New Zealand is a significant driver of economic growth, contributing 6.1% of the GDP (Ministry of Business, Innovation and Employment - MBIE, 2017). An increase in residential building activities directly reinforces GDP growth and leads to a higher demand for labour, resulting in increased employment rates and productivity growth. This, in turn, contributes to overall macroeconomic stability and reinforces GDP growth. An increase in GDP signifies a healthy economy that boosts construction activity (Baharuddin et al., 2019).

Moreover, residential building activities constitute over 70% of the national construction sector (StatsNZ, 2017a). As residential construction work increases, the demand for labour rises, impacting income levels. A rise in income levels can positively influence house prices, as higher pay rates may lead to increased labour costs, subsequently driving construction costs up and affecting house prices. Individuals with high incomes, due to their demand for investments as a source of wealth, have the ability to stimulate the housing market and cause an increase in house prices.

The model presents multiple policy implications for addressing high house prices in New Zealand. First, it is crucial to mitigate the impact of balancing variables (immigration, returning and migrating Kiwis) on population growth and housing demand by focusing on workforce needs

and training gaps. Policymakers should consider regional variations in work and immigration policies. One suggested approach involves promoting the development of medium-sized metropolitan areas as regional hubs to alleviate the burden on major cities (Blunden, 2016). These hubs should encompass critical elements such as educational institutions, transportation links, diversified labour markets, and businesses that attract economic activity. Encouraging public-private partnerships and investment opportunities is another vital policy avenue to sustain advanced industry hubs. Also, relaxing zoning laws could enhance housing affordability, making these hubs more appealing to workers of varying skill levels and striking a balance between population variables and housing prices.

Another policy implication is the need to reform policies and regulations in property investment besides the absence of an integrated taxing system that includes capital gain and income taxes. As a result, credit availability and accessibility are advantages for property investors. This could be why the first home buyer struggles to get onto the property ladder. Hence, creating other financing options for first-home buyers and strengthening property investors' financial policies is essential to sustain house prices (Kofner, 2014; RyanCollins & Murray, 2021). From the monetary policy perspective, the findings detected an uncertain effect on house prices, especially during the recession and economic shocks. Therefore, it might be more effective to consider the regional economic differences and housing market needs when implementing monetary policy.

The historical trend of high housing prices in Auckland created a property bubble market and drove property investment (Rehm & Yang, 2020). However, there is limited evidence to suggest a bubble's effect on other regions in New Zealand. The expensive nature of real estate in New Zealand, relative to potential rental earnings, is partially a result of sustained market vibrancy that led to a broad-based housing bubble over the last decade.

According to Molloy (2020), housing supply regulation significantly impacts housing affordability and, therefore, housing prices. Increasing the cost of investing, such as capital gain tax (CGT) and removing negative gearing on investment, decreases overall demand for housing stocks, leading to lower housing prices. The decline in house prices improves housing affordability by reducing the downpayment requirements of buying a home. This mainly benefits low-income people with limited access to credit, resulting in a noticeable increase in the homeownership rate for these households. As the availability of rental properties diminishes, rents experience a slight increase but is tempered by the decrease in rental demand. However, the slight rise in rents makes homeownership comparatively more affordable, leading high-earning renters to transition into homeownership. The policy change will majorly impact homeowners

who rely on borrowing and negative gearing and may force them to leave the investment property market.

One notable factor contributing to the increased demand for housing in the New Zealand economy is the absence of a comprehensive CGT. In contrast to many other countries, which often impose CGT on asset sales at rates similar to personal income tax rates, New Zealand lacks such a taxation system. Introducing a CGT can be politically sensitive, with potential resistance from various interest groups and political parties. A CGT could influence property markets by discouraging speculative investments and reducing property prices, potentially making housing more affordable for first-time buyers. Investors may adjust their investment strategies to minimise CGT liability, potentially leading to a shift in investment patterns (Pawson & Martin, 2021).

For the monetary policy scenario, it has also been observed that market inflation is inversely related to employment. The drop in employment levels within the construction sector creates a labour shortage that challenges construction costs and productivity (Kim et al., 2020), leading to higher house prices. For instance, the lack of skilled labour delays construction projects and raises labour costs, leading to higher construction costs. As the Ministry of Business, Innovation, and Employment- MBIE (2022) reported, supply chain disruptions and material price fluctuations further exacerbate construction cost pressures. Increased construction costs may be passed on to homebuyers, ultimately increasing house prices.

Furthermore, the level of inflation impacts the effectiveness of interest rates in influencing investment. Olonila et al. (2023) suggested that interest rate instruments, such as monetary policy, effectively stabilise the economy when inflation is low. However, their effectiveness diminishes when inflation is high, as increasing inflation reduces the extent to which interest rates influence investment due to low-interest rates on bank loans. Hence, it is critical to determine the policy trade-offs regarding global factors that substantially impact both the monetary policy and long-term interest rates (Shi et al., 2013).

Regarding the construction costs, the resulting dynamics confirmed that optimising land, labour, and material resources is crucial for improving productivity. Essentially, land costs contribute to the highest proportion of total construction costs. Land-use regulation creates more challenges in residential development. Phibbs and Gurran (2021) advised policymakers to involve urban planners in identifying supply gridlocks for land-use regulation, hence providing opportunities to understand the root cause of house price inflation and affordability constraints. Suggesting a mixed-method of high and low-rise residential buildings concerning the house land area provides

flexible and affordable options (GómezVaro et al., 2022). Also, applying innovation such as prefabrication or material printing has a sustainable and cost-effective effect (Amran et al., 2022). Building a resilient construction industry is necessary to respond and bounce back efficiently in case of economic shocks.

According to StatsNZ (2023a), the number of returning Kiwis contributed to an 8% increase, while departures of Kiwis increased by 85%. Immigrant arrivals increased significantly by 362%, but immigrant departures only saw a slight increase of 8%. Simultaneously, rental prices surged by 41% (StatsNZ, 2023b), but building consents decreased by 25% (StatsNZ, 2023c), and inflation continued to rise. In response to the housing price inflation, the Reserve Bank of New Zealand - RBNZ (2023) implemented various measures to stabilise the housing market. These included changes in monetary policy, such as increasing the LVR and interest rates. Though wage inflation reached its peak, household spending decreased, and labour shortages persisted despite a strong employment rate. However, labour shortages started easing as borders reopened in 2022 post-COVID-19. In this scenario, our model suggests that the decline in building consent contributed to slowing down investment, while high interest rates and LVR measures contributed to decreased house prices.

7 CONCLUSION

This research presented a comprehensive visual model to outline the factors contributing to high house price and their dynamics in New Zealand using the CLD approach. We explored and analysed the benefits and drawbacks of CLD and its robust application to the New Zealand housing system. The components for the CLD modelling were gathered from qualitative data in conjunction with an outlook of expert views to validate. The CLD model provided a meaningful vision of the complex interactions among house price factors. The identified factors include (i) population, (ii) macroeconomic stability, (iii) investment demand, (iv) monetary policy, and (v) construction costs. Accordingly, the population factor drives the pressure demand for new residential construction supply, while the macroeconomic variables, GDP, and employment positively reinforce the new construction supply.

Other macroeconomic variables, such as income and interest rate, are inversely related. However, income is positively related to GDP. The interest rate has played a key role in balancing the investment demand unless restrained by the monetary policy. The monetary policy is expected to restrain investment, deflate market inflation, and sustain employment. Likewise, construction costs have a direct positive effect on house prices. Land use and regulation are the most influential factors in total construction costs. Construction costs are reinforced in an inverse

relationship. This necessitates the need to optimise construction resources to achieve favourable growth in productivity. Based on our model's findings, we discussed several policy implications that require a multifaceted approach considering population dynamics, taxation, inflation, land-use regulations, and the overall economic environment. Policymakers need to strike a balance between these factors to promote housing affordability and market stability.

This research contributes to the knowledge of the literature on the residential construction sector in New Zealand. Providing a fundamental model for the dynamics of high house prices helps to understand this complex interaction. The research findings are expected to provide insights for policymakers and construction industry leaders to make collaborative and informed decisions. The significance of our findings is rooted in the importance of New Zealand's housing market characteristics. Through our literature review, we observed that prior studies on housing price dynamics primarily focused on identifying the causes of high house prices and assessing the influence of government policies on the housing market. In contrast, our research introduces a foundational model for comprehending the dynamics of high house prices, distinct from previous studies. The prevailing era of low interest rates and easily accessible finance has propelled a housing price surge worldwide. In New Zealand, the house price has exceeded that of numerous OECD countries. However, with the potential rise in interest rates and a subsequent decline in prices, New Zealand's housing market could serve as an early warning sign of impending risks or challenges for the global housing market.

Like any others, this research comes with its own set of limitations. The developed CLD could benefit from further enhancement through quantitative simulations. Utilising these simulations across multiple scenarios can offer a more nuanced understanding of the intricate relationships between various factors and relevant variables. A compelling avenue for future research lies in exploring the socio-economic and cultural attributes of diverse cities or regions within New Zealand, with the aim of assessing their potential impact on housing prices.

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